CLAIMS

The invention claimed is:

1. A method of depositing at least one noble metal, comprising:

providing a substrate having at least two regions; a first of the at least two regions being a first material and a second of the at least two regions being a second material different than the first material;

exposing the first and second regions to a mixture comprising at least one precursor of the at least one noble metal and at least one oxidant; and

during the exposing, selectively depositing a layer comprising the at least one noble metal onto the first region relative to the second region.

2. The method of claim 1 wherein the layer consists essentially of the at least one noble metal.

3. The method of claim 1 wherein the first region comprises silicon oxide, and wherein the second region comprises doped non-oxidized silicon.

4. The method of claim 3 wherein the doped non-oxidized silicon of the second region initially has a layer of silicon oxide extending thereover; the method further comprising, prior to the exposing of the first and second regions to the mixture, rinsing the substrate with hydrofluoric acid to remove the layer of silicon oxide from over the second region.

5. The method of claim 1 wherein the first region comprises one or both of tantalum oxide and borophosphosilicate glass, and wherein the second region comprises doped non-oxidized silicon.

6. The method of claim 1 wherein the first region comprises one or both of tantalum oxide and borophosphosilicate glass, and wherein the second region comprises aluminum oxide.

7. The method of claim 1 wherein the first region comprises silicon oxide, and wherein the second region comprises aluminum oxide.

8. The method of claim 1 wherein the at least one oxidant comprises at least one of N_2O, O_2, O_3 and H_2O.

9. The method of claim 1 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Ru, Pd and Ir.

10. The method of claim 1 wherein the selectivity of the depositing is at least about 9:1.

11. The method of claim 1 wherein the selectivity of the depositing is at least about 99:1.

12. The method of claim 1 further comprising exposing the layer comprising the at least one noble metal to conditions which cause the layer to break up into a plurality of agglomerates.

13. The method of claim 12 wherein the conditions include subjecting the layer comprising the at least one noble metal to a temperature of at least about 450°C, under an inert atmosphere, for a time of at least about 1 minute.

14. A method of depositing at least one noble metal, comprising:

providing a substrate comprising first and second materials, the first material being different from the second material;

exposing the first and second materials to at least one precursor of at least one noble metal to form a layer from the at least one precursor along at least a portion of the substrate;

exposing the layer to at least one oxidant to transform the layer; and

wherein the transformed layer is selectively formed over the first material relative to the second material.

15. The method of claim 14 wherein the formation and transformation of the layer are comprised by an atomic layer deposition process occurring in a reaction chamber; the layer being formed as a monolayer or fraction thereof and any excess of the at least one precursor remaining after formation of the monolayer being substantially entirely removed from the reaction chamber prior to introduction of the at least one oxidant into the reaction chamber.

16. The method of claim 14 wherein the transformed layer consists essentially of the at least one noble metal.

17. The method of claim 14 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Pd, Ru and Ir.

18. The method of claim 14 wherein the selectivity of the formation of the transformed layer over the first material relative to the second material is at least about 9:1.

19. The method of claim 14 wherein the selectivity of the formation of the transformed layer over the first material relative to the second material is at least about 99:1.

20. A method of depositing at least one noble metal, comprising:

simultaneously exposing a region comprising silicon oxide and a region comprising doped non-oxidized silicon to at least one precursor of at least one noble metal; and

selectively depositing the at least one noble metal on the silicon dioxide relative to the doped silicon.

21. The method of claim 20 wherein the region comprising silicon oxide consists of phosphosilicate glass or borophosphosilicate glass.

22. The method of claim 20 wherein the doped non-oxidized silicon comprises at least about 1×10^{18} atoms/cm^3 of dopant.

23. The method of claim 22 wherein the dopant is a p-type dopant.

24. The method of claim 22 wherein the dopant is an n-type dopant.

25. The method of claim 22 wherein the dopant consists of phosphorus.

26. The method of claim 20 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Pd, Ru and Ir.

27. The method of claim 20 wherein the selectivity of the depositing is at least about 9:1.

28. The method of claim 20 wherein the selectivity of the depositing is at least about 99:1.

29. The method of claim 20 wherein the selective deposition of the at least one noble metal occurs through a transient non-equilibrium chemical vapor deposition process in which the at least one precursor reacts with at least one oxidant.

30. The method of claim 29 wherein the transient non-equilibrium chemical vapor deposition process occurs in a reaction chamber and comprises:

flowing the at least one precursor of at least one noble metal into the reaction chamber;

partially purging the at least one precursor from the reaction chamber by flowing one or more non-reactive purge gases through the chamber;

after the partial purge of the at least one precursor, flowing the at least one oxidant into the reaction chamber; and

partially purging the at least one oxidant from the reaction chamber by flowing one or more non-reactive purge gases through the chamber.

31. The method of claim 30 wherein the at least one oxidant consists of a mixture of N_2O, O_2, O_3 and H_2O.

32. The method of claim 31 wherein the mixture contains about 2 parts of N_2O for every part of O_2.

33. A method of depositing at least one noble metal, comprising:

simultaneously exposing a region comprising silicon oxide and a region comprising aluminum oxide to at least one precursor of at least one noble metal; and

selectively depositing the at least one noble metal on the silicon oxide relative to the aluminum oxide.

34. The method of claim 33 wherein the region comprising silicon oxide consists of borophosphosilicate glass or phosphosilicate glass.

35. The method of claim 33 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Ru, Pd and Ir.

36. The method of claim 33 wherein the selectivity of the depositing is at least about 9:1.

37. The method of claim 33 wherein the selectivity of the depositing is at least about 99:1.

38. The method of claim 33 wherein the selective deposition of the at least one noble metal occurs through a transient non-equilibrium chemical vapor deposition process in which the at least one precursor reacts with at least one oxidant.

39. The method of claim 38 wherein the transient non-equilibrium chemical vapor deposition process occurs in a reaction chamber and comprises:

flowing the at least one precursor of at least one noble metal into the reaction chamber;

partially purging the at least one precursor from the reaction chamber by flowing one or more non-reactive purge gases through the chamber;

after the partial purge of the at least one precursor, flowing the at least one oxidant into the reaction chamber; and

partially purging the at least one oxidant from the reaction chamber by flowing one or more non-reactive purge gases through the chamber.

40. The method of claim 39 wherein the at least one oxidant consists of a mixture comprising at least two of N_2O, O_2, O_3 and H_2O.

41. The method of claim 40 wherein the mixture contains about 2 parts of N_2O for every part of O_2.

42. A method of depositing at least one noble metal, comprising:

simultaneously exposing a first region and a second region to at least one precursor of at least one noble metal; the first region comprising thermally grown silicon dioxide and the second region comprising silicon, oxygen, and one or both of boron and phosphorus; and

selectively depositing the at least one noble metal on the second region relative to the first region.

43. The method of claim 42 wherein the second region consists of borophosphosilicate glass.

44. The method of claim 42 wherein the second region consists of phosphosilicate glass.

45. The method of claim 42 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Ru, Pd and Ir.

46. The method of claim 42 wherein the selectivity of the depositing is at least about 9:1.

47. The method of claim 42 wherein the selectivity of the depositing is at least about 99:1.

48. The method of claim 42 wherein the selective deposition of the at least one noble metal occurs through a transient non-equilibrium chemical vapor deposition process in which the at least one precursor reacts with at least one oxidant.

49. The method of claim 48 wherein the transient non-equilibrium chemical vapor deposition process occurs in a reaction chamber and comprises:

flowing the at least one precursor of at least one noble metal into the reaction chamber;

partially purging the at least one precursor from the reaction chamber by flowing one or more non-reactive purge gases through the chamber;

after the partial purge of the at least one precursor, flowing the at least one oxidant into the reaction chamber; and

partially purging the at least one oxidant from the reaction chamber by flowing one or more non-reactive purge gases through the chamber.

50. The method of claim 49 wherein the at least one oxidant consists of a mixture of comprising at least two of N_2O, O_2, O_3 and H_2O.

51. The method of claim 50 wherein the mixture contains about 2 parts of N_2O for every part of O_2.

52. A method of forming at least one capacitor construction, comprising:

providing a substrate comprising silicon, oxygen and at least one of phosphorus and boron;

forming a first layer over the substrate, the first layer comprising aluminum oxide, thermally grown silicon dioxide or doped silicon;

forming at least one opening extending through the first layer and into the substrate;

after forming the at least one opening, a first region being defined as a portion of the substrate within the at least one opening and a second region being defined as an upper portion of the first layer;

exposing the first and second regions to a mixture comprising at least one precursor of at least one noble metal and at least one oxidant;

during the exposing, selectively depositing a second layer comprising the at least one noble metal onto the first region relative to the second region;

forming a dielectric material over the second layer; and

forming a conductive material over the dielectric material; the conductive material, dielectric material and second layer together being incorporated into the capacitor construction.

53. The method of claim 52 wherein the substrate comprises borophosphosilicate glass.

54. The method of claim 52 wherein the substrate comprises phosphosilicate glass.

55. The method of claim 52 wherein the first layer comprises doped non-oxidized silicon.

56. The method of claim 52 wherein the first layer comprises thermally grown silicon dioxide.

57. The method of claim 52 wherein the first layer comprises aluminum oxide.

58. The method of claim 52 wherein the second layer consists essentially of the at least one noble metal.

59. The method of claim 52 wherein the at least one oxidant comprises at least one of N_2O, O_2, O_3 and H_2O.

60. The method of claim 52 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Ru, Pd and Ir.

61. The method of claim 52 wherein the selectivity of the depositing is at least about 9:1.

62. The method of claim 52 wherein the selectivity of the depositing is at least about 99:1.

63. The method of claim 52 wherein the exposing and selective deposition occur as parts of a transient non-equilibrium chemical vapor deposition process within a reaction chamber; the transient non-equilibrium chemical vapor deposition process comprising:

flowing the at least one precursor of at least one noble metal into the reaction chamber;

partially purging the at least one precursor from the reaction chamber by flowing one or more non-reactive purge gases through the chamber;

after the partial purge of the at least one precursor, flowing the at least one oxidant into the reaction chamber; and

partially purging the at least one oxidant from the reaction chamber by flowing one or more non-reactive purge gases through the chamber.

64. The method of claim 63 wherein the at least one oxidant consists of a mixture comprising at least two of N_2O, O_2, O_3 and H_2O.

65. The method of claim 64 wherein the mixture contains about 2 parts of N_2O for every part of O_2.

66. A method of forming at least one capacitor construction, comprising:

providing a substrate;

forming a first layer over the substrate;

forming at least one opening extending through the first layer and into the substrate;

after forming the at least one opening, a first region being defined as a portion of the substrate within the opening and a second region being defined as an upper portion of the first layer;

exposing the first and second regions to a mixture comprising at least one oxidant and at least one precursor of at least one noble metal;

during the exposing, selectively depositing a second layer comprising the at least one noble metal onto the first region relative to the second region;

exposing the second layer to conditions which cause the second layer to form into a plurality of agglomerates;

forming a first conductive material over the agglomerates;

forming a dielectric material over the first conductive material; and

forming a second conductive material over the dielectric material; the second conductive material, dielectric material and first conductive material together being incorporated into the capacitor construction.

67. The method of claim 66 wherein the first region comprises an electrically insulative material.

68. The method of claim 66 wherein the first region comprises silicon, oxygen and at least one of phosphorus and boron.

69. The method of claim 66 wherein the first region comprises borophosphosilicate glass.

70. The method of claim 66 wherein the first region comprises phosphosilicate glass.

71. The method of claim 69 wherein the first layer comprises doped non-oxidized silicon.

72. The method of claim 69 wherein the first layer comprises thermally grown silicon dioxide.

73. The method of claim 69 wherein the first layer comprises aluminum oxide.

74. The method of claim 66 further comprising removing the first layer prior to forming the first conductive material.

75. The method of claim 66 wherein the conditions which cause the second layer to form into the plurality of agglomerates include subjecting the second layer to a temperature of at least about 450°C, under an inert atmosphere, for a time of at least about 1 minute.

76. The method of claim 75 wherein the temperature is at least about 500°C.

77. The method of claim 75 wherein the temperature is at least about 700°C.

78. The method of claim 66 wherein the second layer consists essentially of the at least one noble metal.

79. The method of claim 66 wherein the at least one oxidant comprises one or more of N_2O, O_2, O_3 and H_2O.

80. The method of claim 66 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Ru, Pd and Ir.

81. The method of claim 66 wherein the at least one noble metal comprises Pt.

82. The method of claim 66 wherein the selectivity of the depositing is at least about 9:1.

83. The method of claim 66 wherein the selectivity of the depositing is at least about 99:1.

84. The method of claim 66 wherein the exposing and selective deposition occur as parts of a transient non-equilibrium chemical vapor deposition process within a reaction chamber; the transient non-equilibrium chemical vapor deposition process comprising:

flowing the at least one precursor of at least one noble metal into the reaction chamber;

partially purging the at least one precursor from the reaction chamber by flowing one or more non-reactive purge gases through the chamber;

after the partial purge of the at least one precursor, flowing the at least one oxidant into the reaction chamber; and

partially purging the at least one oxidant from the reaction chamber by flowing one or more non-reactive purge gases through the chamber.

85. The method of claim 84 wherein the at least one oxidant consists of a mixture of two or more of N_2O, O_2, O_3 and H_2O.

86. The method of claim 85 wherein the mixture contains about 2 parts of N_2O for every part of O_2.

87. A method of forming at least one capacitor construction, comprising:

providing a substrate;

forming a first layer over the substrate;

forming at least one opening extending through the first layer and into the substrate;

after forming the at least one opening, a first region being defined as a portion of the substrate within the opening and a second region being defined as an upper portion of the first layer; the first and second regions having different chemical compositions relative to one another;

exposing the first and second regions to a mixture comprising at least one oxidant and at least one precursor of at least one noble metal to selectively deposit a second layer comprising the at least one noble metal onto the first region relative to the second region;

exposing the second layer to conditions which cause the second layer to form into a plurality of agglomerates;

etching into the substrate while using the agglomerates as a mask, the etching forming cavities extending into the first region;

after the etching, forming a first conductive material within the at least one opening and extending into the cavities in the first region, forming a dielectric material over the first conductive material, and forming a second conductive material over the dielectric material; the second conductive material, dielectric material and first conductive material together being incorporated into the capacitor construction.

88. The method of claim 87 further comprising removing the agglomerates prior to forming the first conductive material within the openings.

89. The method of claim 87 wherein the agglomerates remain as the first conductive material is formed within the openings; and wherein the first conductive material is formed in physical contact with the agglomerates.

90. The method of claim 87 wherein the first region comprises an electrically insulative material.

91. The method of claim 87 wherein the first region comprises silicon, oxygen and at least one of phosphorus and boron.

92. The method of claim 87 wherein the first region comprises borophosphosilicate glass.

93. The method of claim 87 wherein the first region comprises phosphosilicate glass.

94. The method of claim 87 wherein the second region comprises doped non-oxidized silicon.

95. The method of claim 87 wherein the second region comprises thermally grown silicon dioxide.

96. The method of claim 87 wherein the second region comprises aluminum oxide.

97. The method of claim 87 wherein the conditions which cause the second layer to form into the plurality of agglomerates include subjecting the second layer to a temperature of at least about 450°C, under an inert atmosphere, for a time of at least about 1 minute.

98. The method of claim 97 wherein the temperature is at least about 500°C.

99. The method of claim 97 wherein the temperature is at least about 700°C.

100. The method of claim 87 wherein the second layer consists essentially of the at least one noble metal.

101. The method of claim 87 wherein the at least one oxidant comprises on or more of N_2O, O_2, O_3 and H_2O.

102. The method of claim 87 wherein the at least one noble metal is selected from the group consisting of Pt, Rh, Ru, Pd and Ir.

103. The method of claim 87 wherein the selectivity of the depositing is at least about 9:1.

104. The method of claim 87 wherein the selectivity of the depositing is at least about 99:1.

105. The method of claim 87 wherein the exposing and selective deposition occur as parts of a transient non-equilibrium chemical vapor deposition process within a reaction chamber; the transient non-equilibrium chemical vapor deposition process comprising:

flowing the at least one precursor of at least one noble metal into the reaction chamber;

partially purging the at least one precursor from the reaction chamber by flowing one or more non-reactive purge gases through the chamber;

after the partial purge of the at least one precursor, flowing the at least one oxidant into the reaction chamber; and

partially purging the at least one oxidant from the reaction chamber by flowing one or more non-reactive purge gases through the chamber.

106. The method of claim 105 wherein the at least one oxidant consists of a mixture of two or more of N_2O, O_2, O_3 and H_2O.

107. The method of claim 106 wherein the mixture contains about 2 parts of N_2O for every part of O_2.

108. A capacitor construction, comprising:

an electrically insulative material;

a region extending into the material, the material comprising a periphery around the region;

agglomerates along the periphery; the agglomerates comprising one or more noble metals;

a first conductive layer within the region and extending over agglomerates;

a dielectric layer over the first conductive layer; and

a second conductive layer over the dielectric layer; the second conductive layer being capacitively coupled with the first conductive layer.

109. The capacitor construction of claim 108 wherein the insulative material comprises borophosphosilicate glass.

110. The capacitor construction of claim 108 wherein the insulative material comprises phosphosilicate glass.

111. The capacitor construction of claim 108 wherein the insulative material comprises borophosphosilicate glass having one or both of silicon dioxide and aluminum oxide thereover.

112. The capacitor construction of claim 108 further comprising cavities extending into the periphery between the agglomerates, and wherein the first conductive layer extends into the cavities.

113. The capacitor construction of claim 108 wherein the one or more noble metals are selected from the group consisting of Pt, Rh, Ru, Pd and Ir.

114. The capacitor construction of claim 108 wherein the agglomerates consist essentially of the one or more noble metals.

115. The capacitor construction of claim 108 wherein the agglomerates consist essentially of Pt.

116. The capacitor construction of claim 108 incorporated into a DRAM array.